II. Amendments to the Claims

This listing of claims replaces without prejudice all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1-61 (Cancelled)

62. (New) An apparatus for heating a flowable material, comprising:

a metallic core having (i) an inside surface configured to contact a pressurized injection material, and (ii) an outside surface, said metallic core being configured to withstand the pressure of the pressurized injection material;

an alternating current heater device coiled in multiple turns against the core in a helical pattern and disposed against and in contact with said metallic core; and

an electrical insulator disposed between said metallic core and said alternating current heater device;

said metallic core being configured to receive heating from said alternating current heater device, without an auxiliary cooling structure.

63. (New) Apparatus according to Claim 62, wherein said apparatus comprises an injection molding nozzle.

64. (New) Apparatus according to Claim 62, wherein said alternating current heater device heats said metallic core by one of:

(i) resistive heating;

(ii) inductive heating; and

(iii) resistive and inductive heating.

65. (New) Apparatus according to any one of Claims 62, 63, or 64, wherein at least one of the metallic core inner surface and outer surface includes a groove, and wherein said alternating current heater device is disposed in said groove.

66. (New) Apparatus according to Claim 65, wherein said groove comprises a helical groove, and wherein said alternating current heater device comprises a helical coil disposed in said helical groove.

67. (New) Apparatus according to Claim 66, wherein said alternating current heater device helical coil and said electrical insulator are pressed into said helical groove.

68. (New) Apparatus according to any one of Claims 62, 63, or 64, wherein said alternating current heater device comprises a high resistivity material, and wherein said electrical insulator comprises a thermally conductive material.

69. (New) Apparatus according to any one of Claims 62, 63, or 64, wherein said electrical insulator is in contact with said metallic core inner surface.

70. (New) Apparatus according to Claim 69, wherein said electrical insulator has an outer surface that is substantially even with the outer surface of the metallic core.

71. (New) Apparatus according to Claim 69, wherein said electrical insulator is in contact with said metallic core outer surface.

72. (New) Apparatus according to Claim 71, wherein said electrical insulator has an outer surface that is substantially even with the inner surface of the metallic core.

73. (New) Apparatus according to any one of Claims 62, 63, or 64, wherein said electrical insulator comprises (i) an electrically insulative material that is also thermally conductive, and (ii) a metallic sheath disposed around the insulative material.

74. (New) Apparatus according to any one of Claims 62, 63, or 64, wherein said alternating current heater device comprises a nickel chromium alloy.

75. (New) Apparatus according to any one of Claims 62, 63, or 64, further comprising a metallic yoke disposed around said metallic core.

76. (New) Apparatus according to Claim 75, wherein the metallic core and the metallic yoke each comprises a ferromagnetic material.

77. (New) Apparatus according to Claim 75, wherein the metallic yoke includes a sleeve fitting tightly against said alternating current heater device and said electrical insulator.

78. (New) Apparatus according to Claim 77, wherein the sleeve is substantially thinner than the metallic core.

79. (New) Apparatus according to Claim 77, wherein the sleeve is approximately the same thickness as the metallic core.

80. (New) Apparatus according to any one of Claims 62, 63, or 64, further comprising metallic structure disposed between the coils of said alternating current heater device.

81. (New) An apparatus for heating a flowable material, comprising:

a ferromagnetic core configured to transmit a pressurized molding material; and

an alternating current heater in contact with at least one of (i) an inside surface of said ferromagnetic core, and (ii) an outside surface of said ferromagnetic core, said alternating current heater being coiled against the core in a helical pattern, said alternating current heater being configured to (i) conductively heat said ferromagnetic core, and (ii) inductively heat said ferromagnetic core in the absence of induction-heating cooling structure;

said alternating current heater comprising a resistive element surrounded by an electrically-insulating but thermally-conducting insulator.

82. (New) Apparatus according to Claim 81, wherein said alternating current heater is pressed into a groove in at least one of (i) the inside surface of said ferromagnetic core, and (ii) the outside surface of said ferromagnetic core.

83. (New) Apparatus according to Claim 81, wherein said alternating current heater comprises a nickel-chromium element surrounded by a magnesium oxide insulator.

84. (New) Apparatus according to Claim 81, wherein said ferromagnetic core comprises a thixotropic injection molding nozzle.

85. (New) Apparatus according to Claim 81, wherein said alternating current heater is disposed in a liner in contact with said ferromagnetic core.

86. (New) Apparatus according to Claim 81, wherein said alternating current heater is disposed on an inside surface of said ferromagnetic core, and further comprising a wear-resistant layer disposed over said alternating current heater.

87. (New) Apparatus according to Claim 86, wherein said wear-resistant layer is disposed with a sufficient thickness such that an inside surface of said wear-resistant layer provides a substantially smooth bore.

88. (New) Apparatus according to Claim 81, further comprising a ferromagnetic yoke coupled to an outside of said ferromagnetic core such that said alternating current heater also heats said ferromagnetic yoke conductively and inductively.

89. (New) An apparatus for heating a flowable material, comprising:

a tubular core element having a bore configured to transmit a pressurized molding material;

an alternating current heater in contact with said core element and configured to heat said core element both inductively and conductively, in the absence of induction-heating cooling structure, said alternating current heater comprising an electrically conductive element surrounded by an electrical insulator, said electrical insulator configured to conduct heat from said electrically conductive element to said core element said alternating current heater being disposed in a coiled helical pattern; and

a protective layer disposed over said alternating current heater.

90. (New) Apparatus according to Claim 89, wherein said alternating current heater is disposed in contact with an inside surface of said core element.

91. (New) Apparatus according to Claim 90, wherein said alternating current heater is pressed into a helical groove in the inside surface of said core element.

92. (New) Apparatus according to Claim 89, wherein said alternating current heater is disposed in contact with an outside surface of said core element.

93. (New) Apparatus according to Claim 92, wherein said alternating current heater is pressed into a helical groove in the outside surface of said core element.

94. (New) Apparatus according to Claim 92, wherein said alternating current heater is pressed into a helical groove in an inside surface of a liner disposed adjacent the outside surface of said core element.

95. (New) Apparatus according to Claim 89, further comprising a yoke element coupled to said core element, said alternating current heater contacting said yoke element and being configured to heat said yoke element both inductively and conductively.

96. (New) Apparatus according to Claim 89, further comprising a metal structure disposed between the coils of said alternating current heater.

97. (New) Apparatus according to Claim 89, wherein said alternating current heater comprises a nickel-chromium element surrounded by a magnesium oxide insulator.